Impact of Urban Growth on Land Use/Land Cover : A Study of Dumka Nagar Nigam.

A Research Proposal

Submitted for the registration for

Ph.D (Geography)

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Title of the Ph.D Research Project- Impact of Urban Growth on Land Use/Land Cover : A Study of Dumka Nagar Nigam.

1. Introduction

Urban growth, a phenomenon that shapes landscapes all over the world, often results in notable environmental and socio-economic challenges. And in Indian context, we find that towns which are small like Dumka Nagar Nigam are showing rapid urbanization due to infrastructural development, rapid growth in population and change in economic activities. This rapid urbanization has huge impact on land use and land cover (LULC), leading to problems such as soil pollution, deforestation, reduction of agricultural land and desertification. These processes of changing Land use Land cover patterns negatively affect the population by increasing occurence of natural or man-made hazards, reducing availability of resources, and disturbing the balance of ecosystems. Land cover changes due to urban growth, also create problems such as low agricultural productivity and poor quality of life of the local population.

Urbanization is a process which alters land use and land cover (LULC) patterns and its role can be seen in the transformation of natural land cover or landscapes into built-up premises, in influencing socio-economic conditions of the area, and in changing land use or land management practices.

In Dumka Nagar Nigam, a rapidly urbanizing town in Dumka district, Jharkhand, significant LULC changes has been observed which is being caused by increasing population density, change in patterns of economic activities and development of new infrastructures. Dumka Nagar Nigam or Dumka Sadar, the headquarter of the district, represents a critical interrelationship between urban growth and LULC changes, making it ideal for a case study. Dumka being the second capital of Jharkhand, it faces challenges which are unique in nature, such as limited access to resources, lack of urban planning, and weak administrative structures. And further these challenges intensify the impacts of urban growth on LULC. So, to adress these issues, a geographical perspective is required to study and understand the drivers, patterns and the challenges of urban growth.

This research aims to study and find the impact of urban growth on LULC in Dumka Nagar Nigam by using geospatial techniques, field observation methods and focussed surveys. This study will help in analysing the transformation of land use patterns over time and will provide useful insights for sustainable urban growth strategies. It will also provide recommendations for sustainable development and urban planning for small-towns, by filling the gaps in existing literature and understanding of the study area. And the dynamic interrelationship

between LULC and urban growth will also be studied in a detailed manner in order to find out how they impact each other and what are their overall impact on the development of Dumka Nagar Nigam. A holistic approach will be followed in order to suggest strategies which can help in the making of sustainable cities, that can allow our future generations to live happily.

2. State of the Art

Urbanization acts as a double-edged sword when it comes to development. While it promotes growth of economy and advancements in infrastructure on one hand, simultaneously it also exerts noteworthy pressure on land resources and environment on the other hand.

Scholars like Jaiswal (2022)[(1)] discusses the role of urban growth in changing land cover patterns, highlighting its impact on land degradation and climate induced change. This type of unplanned and haphazard urban growth leads to ecosystem disruption, including degradation of land and loss of biodiversity which are almost irreversible.

In India, Calì, M. (2008) highlights that towns of smaller sizes do not have the institutional frameworks and the resources which are needed to manage urban areas, thus, urban growth in small towns often leads to environmental repercussions. He says “I also found that although the level of urbanisation and that of economic development go hand in hand across Indian states over time, this relation is not a very strong one. On the other hand, it emerges quite clearly that the rate of urbanisation (i.e. how fast a state urbanises) and the rate of growth appear to be negatively correlated. This finding is somewhat surprising: in the ‘average’ Indian state, periods of faster urbanisation tend to be associated with periods of slower growth. This may be related to urbanisation patterns driven by push rather than pull factors, which are not favourable to growth if not accompanied by the required investments in the urban sector.” [(2)] (Calì, M. - 2008)

Among studies focussed on Jharkhand, such as of Rakesh (2014), emphasizes on the impact of mining activities, urban sprawl, and deforestation on land use. These studies, focusses largely on industrial impacts at large scale, leaving small-towns situations underexplored. He mentions, “The decadal urban population growth was the highest in district Pakur followed by district Palamu. On the other hand, the decadal growth of urban population was negative in Hazaribagh, Gumla, Dumka and Paschim Singhbhum districts which means that the urban

population in these districts decreased between 2001 and 2011." (Rakesh , 2014)[3]. He talks about the decadal growth of population and its importance in analysing the growth of urban areas. So, this calls for a localised intervention to assess the relation of urban growth and population.

Land use pattern of Dumka (2016-2017) :-

Sr. No	Land use	Area
1.	Total Area (sq.km.)	378.8
2.	Forest Land (ha)	3996.92
3.	Barren and non agriculture land (ha)	4064.75
4.	Cultivable waste land (ha)	2325.35
5.	Permanent pasture and grassing land (ha)	1510.85
6.	Land under miscellaneous tree (ha)	507.89
7.	Other than current fallow (ha)	4834.43
8.	Current fallow (ha)	10038.42
9.	Net sown area (ha)	5419.08

Source – Report on aquifer maps and management plan of Dumka district, Jharkhand State 2018-19 (Part - 1)[4].

Urban Growth Patterns and Drivers: "Potential drivers only drive the city development, which leads to the formation of new growth drivers, and this viscos loop leads to urban sprawl. It is necessary to investigate the influence of growth drivers on the city's growth pattern. The objectives of this study are to assess the spatiotemporal change in the city's growth pattern and to determine which growth factors are significantly driving the growth." Sheladiya & Patel (2023)[5].

The above literature defines how one driver influences another, and therefore urbanisation becomes like a loop where growth is unregulated and it happens in a haphazard manner. He underlines that urban growth in small towns is driven by unplanned development of infrastructure and unregulated migration, which leads to environmental consequences.

Changes in LULC: Studies conducted on urban growth demonstrats how urban expansion has resulted in modifications of LULC, mainly in developing countries where urbanization is unplanned.

Bhattacharjee & Ghosh, (2015) mentions in this context, “Urban and city planning have drawn concern in the various fields of study for the last few decades. It primarily focuses on the distribution pattern of land-use/ land-cover (LULC) of the terrain”. [6]. “Further, forecasting the land-use/ land-cover (LULC) change will help in assessing the impact of urbanization, city planning, and other socio-economic activities. It has direct impact on several environmental threats, such as: urban heat island, drought, flood, etc”. [6]

Urbanisation and LULC Changes: Urbanisation has huge impact on local ecosystems, which leads to loss of habitat, increase in carbon emissions, and change in surface temperature of the region. Mundhe and Jaybhaye (2014) mentions in this context that, “The decreasing area under water bodies, vegetation, fallow land and agricultural land etc. directly or indirectly causing in degradation of environment. The major findings of the image analysis revealed that area under built-up land have been increasing significantly in the fringe area of the city. It leads to problem like poor sanitation, poor road connectivity and adverse ratio of public amenities and population”.[7] They highlighted the fact, how urban expansion results in unplanned changes of land use. The areas of useful land covers like vegetation and water bodies changes due to factors like deforestation, soil pollution and water pollution which then causes LULC changes.

Sustainable land use management: The United Nations (2018) [8] underlines the need for sustainable urbanization, to balance development and the environment. Studies conducted in this field shows the lack of governance mechanisms in small towns like Dumka, which acts as a bottleneck for sustainable development and land use management.

Izakovičová .et al (2018) says, “In particular, economic and social benefits are directly dependent on an organization’s property including land use, ownership, and other rights, without which any planning activity in the landscape is practically impossible. The successful application of sustainable land use management requires multiple social measures at all levels of legislation, economic outcomes, education, and teaching.”[9] The above mentioned literature talks about the steps on how land management can be done in a sustainable way.

Research Gap: Available literature in this field gives a general overview of urban growth and its impact on LULC but lacks a detailed analysis on small towns like Dumka. This research will try to address these gaps by exploring the interrelations between urban growth, LULC, and socio-economic attributes in a localised context.

3. Problems to Be Investigated

1. What are the key drivers contributing to rapid urban growth and what are the patterns of urban growth in Dumka Nagar Nigam?

2. What are the changes occuring in LULC in Dumka Nagar Nigam?

3. What are the impacts of urban growth on LULC changes in Dumka Nagar Nigam?

4. What are the policies and adaptive strategies which can be adopted for sustainable land use management and urban planning?

4. Objectives of the Study

1.To analyze the patterns and extent of urban growth in Dumka Nagar Nigam over the past two decades.

2. To evaluate the spatial and temporal changes in LULC in Dumka Nagar Nigam over the past two decades.

3. To evaluate the impact of urban growth on land use and land cover changes, with a focus on soil erosion, vegetation loss, water resource depletion and socio-economic structures.

4. To develop policy recommendations for sustainable land use management and urban planning.

5. Hypotheses

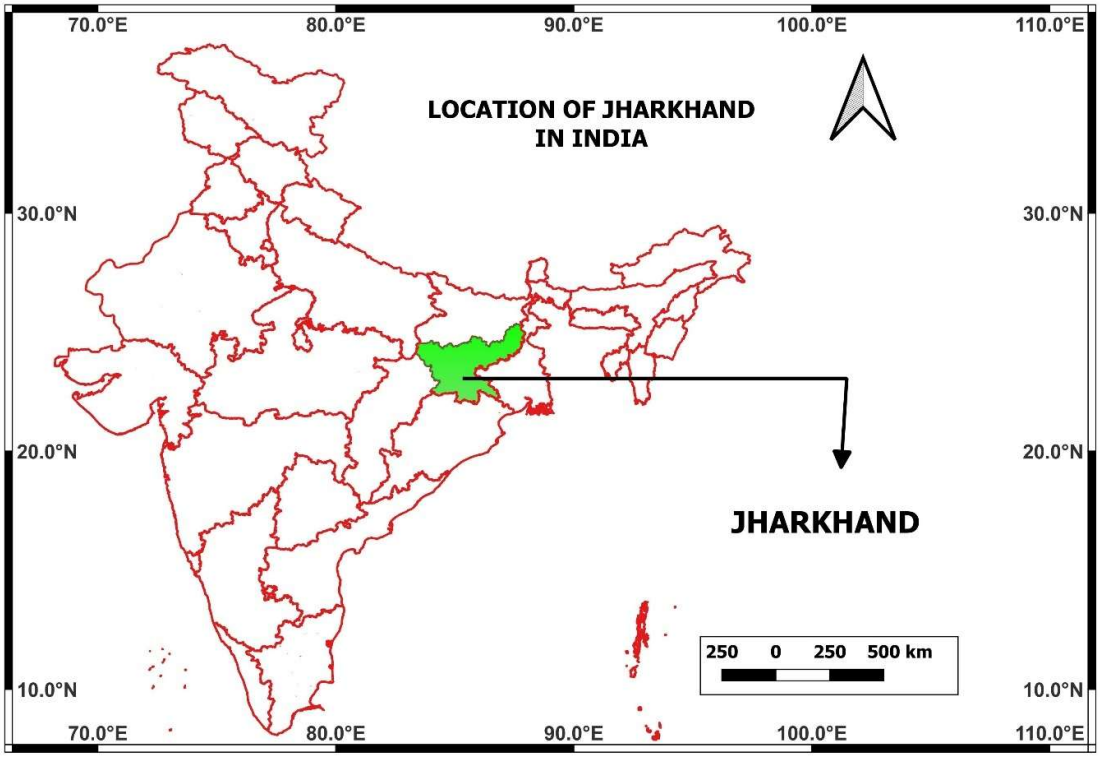
1. Urban growth in Dumka Nagar Nigam has significantly altered the land use and land cover patterns over the past two decades.

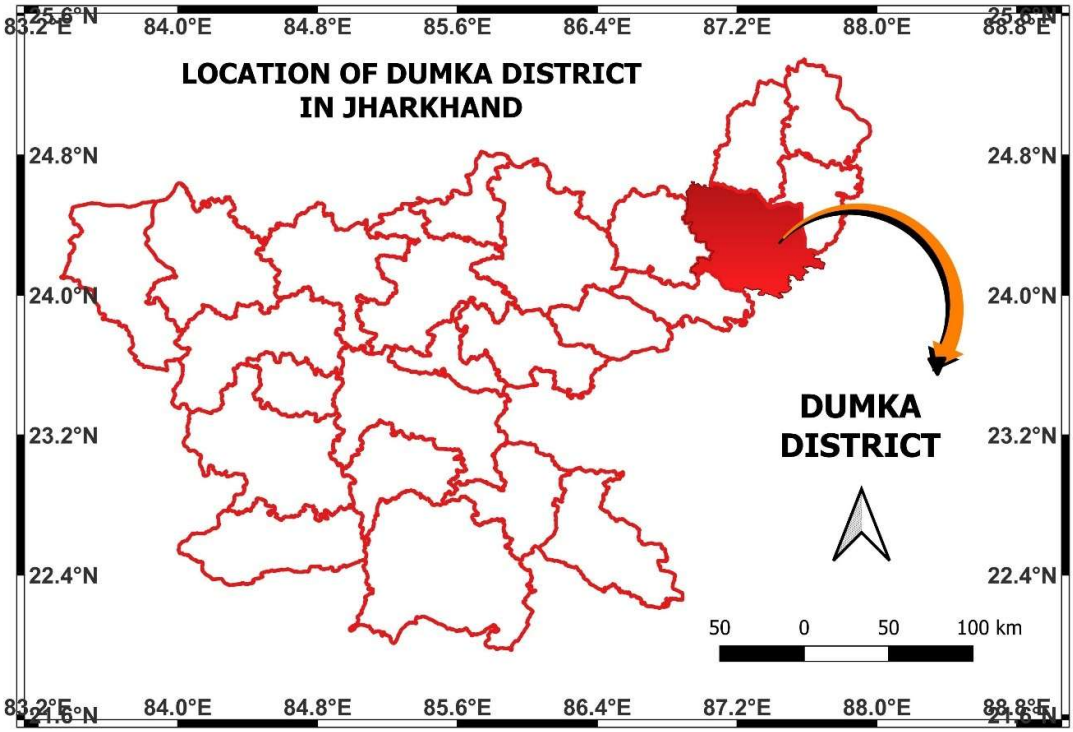
2. There is a strong correlation between urban expansion and LULC changes in the study area.

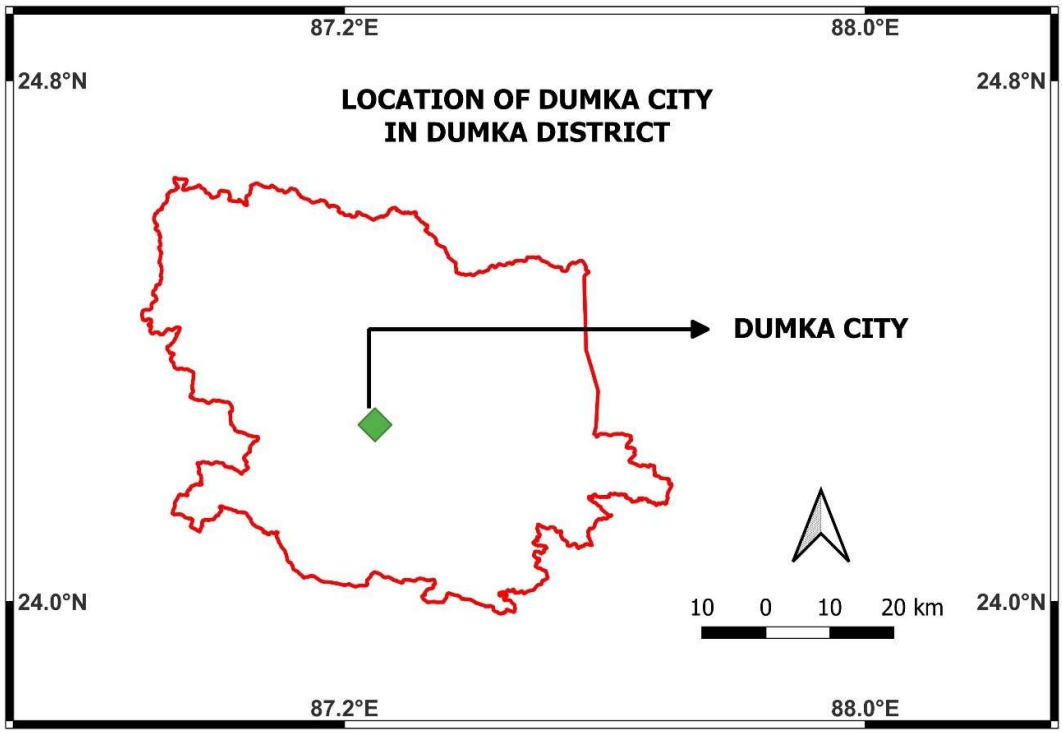
3. Sustainable urban planning practices can mitigate the negative impacts of urban growth on LULC.

6. Research design and methodology:

Study Area :- The district of Dumka, is located in the state of Jharkhand. This district consists of 10 blocks. These blocks are Shikaripara, Gopikandar, Ranishwar, Saraiyahat, Kathikund, Masalia, Ramgarh, Dumka Sadar, Jama and Jarmundi. For the purpose of studying the region in more effective way, the Dumka Sadar block or the **Dumka Nagar Nigam** will be divided into three subdivisions, so that we can analyse Urban Growth's impact on LULC in a better way by comparing the data of these divided wards. These divisions will be named as Study area A, Study area B and Study area C. Taking the approximate area as the base for the division of these regions, the wards will be divided in these groups or subdivisions, to conduct a detailed comparative study. These divisions will be made on the basis of ground level study on the field after properly mapping the area.




LOCATION OF DUMKA DISTRICT
IN JHARKHAND
83.2°E
84.0°E
84.8°E
85.6°E
86.4°E
87.2°E
88.0°E
88.8°E
24.8°N
24.0°N
23.2°N
22.4°N
DUMKA
DISTRICT
50 0 50 100 km


87.2°E
88.0°E
24.8°N
24.0°N
LOCATION OF DUMKA CITY
IN DUMKA DISTRICT
DUMKA CITY
10 0 10 20 km

Sampling :- Sampling method will be used to select households and individuals for in-depth study. Approximately 200 households will be surveyed, with a mix of high class, middle class, low class residentials and the commuters. On an average 10 households will be selected from each ward with the help of stratified sampling method, and the data will be collected with the help of different data collections tools from the local residentials after interviewing at least 5-6 subjects.

To find out the impact of urban growth on LULC in Dumka Nagar Nigam, the secondary data will also be used to compare with present data in order to assess the decadal urban growth and the changes occuring as a result of urban growth. Changes can be studied by taking into consideration, the physical aspects as well as the spatial analysis of LULC of the research area. This study will focus on urban regions, and urban sprawl mainly the twenty-one wards, where the effect of urban growth can be seen and also on the fringes which are slowly changing with time.

Interaction of people with their culture, economy and environment will also be studied by collecting data with the help of specifically focussed questionnaires and focus group interviews, so that each and every qualitative as well as quantitative data can be put to use properly in order to asses Land use/Land cover changes and the roles of local residentials in it.

Tentative Chapterisation

- Introduction

Chapter 1 - Geographical setup of the study area.

Chapter 2 - Urban Growth Patterns of the study area.

Chapter 3 - Impact of Urban Growth on LULC Changes.

Chapter 4 - Evaluation of spatial and temporal changes in LULC.

Chapter 5 - Recommendations on sustainable Urban Planning and Land Use Management.

- Conclusion
- Bibliography
- Appendix

7. Sources of data and tools to be used in collection of data:

Primary Data -The primary data will be collected with the help of questionnaire, observation, personal interviews and focus group discussions from the local people as well as the elected members of Nagar Nigam, government officials, and urban planners.

Secondary Data- Analysis of census data, urban growth records, land use maps, satellite images, municipal records and environmental reports.

Geographical Tools – Mapping, geographical analysis and analysis of themes will be put to use in order to interpret urban growth and LULC trends.

Other tools for data collection - Cameras, Locational maps, MS Word, MS Excel, QGIS, Questionnaires, Schedules, Interviews and Workshops.

8. Analysis of data

Data Analysis :- After acquiring the primary data and the related secondary data, the data will be analysed and then the hypothesis will be tested.

Statistical techniques and comparative analysis will be used to identify correlations between urban growth, land use and land cover, and socio-economic structures. And on the basis of the results, the research will be concluded showing the impact of the Urban Growth on the overall holistic development of the study area, on its evironment, ecosystem, Land Use and Land Cover changes and on urban sustainability.

Techniques for Assessment :- Land cover can be analysed using indicators of soil quality and by assessing vegetation loss, deforestation and land use changes. Land use will be assessed through indicators like access to resources, housing, and by analysing socio-economic structures and mental maps of the local populations.

After the collection of data, the next step will be to analyse it. So, first the data will be edited in order to identify and minimise the mistakes, calculation errors or any type of gap in the information provided by the respondent.

Qualitative data gained from interviews and group discussions will be categorised into themes. Content analysis of interviews and FGDs will be conducted to identify themes and patterns in cultural adaptation and identity transformation.

The **quantitative data** will be processed to be converted into numerical values or codes. After tabulation, data analysis would be conducted with the help of mathematical and statistical techniques such as percentage, average, mean, median, standard deviation, etc. Descriptive statistics will be employed to analyze migration trends and patterns. GIS tools will be used to map the spatial distribution of Land Degradation and their impact on environment and human life.

9. Significance of the study:

The area chosen for the study has never been investigated throughly in order to study the LULC and urban sustainability, so, the area is ripe for a detailed research work.

This research will:

1. Provide a comprehensive geographical analysis of urban growth and LULC in Dumka Nagar Nigam.
2. Highlight the socio-economic and environmental challenges faced by local population.
3. Offer actionable insights for policymakers and planners to promote sustainable urban development.

The insights gained will offer valuable knowledge for both academic inquiry and policy-making, particularly concerning the preservation of environment and the development of sustainable strategies that can uplift the quality of life in urban areas.

The objectives of this study will give a broad knowledge about the impacts of Land on human society and vice-versa. And will help in understanding the role of geographical aspects in socio-economic changes.

10. Relevance to present day problems and need to the society:

At present, most of the urban areas are facing similar problems like economic backwardness, poverty, poor living conditions, social backwardness, etc and these core problems have been imposed to the residentials because of the rapid urban growth. So, to address issues such as land pollution, poor quality of life, lack of social well being etc., we must first analyse the causes underneath and this research is a small step towards solving these big challenges.

This study will help in understanding these problems and will focus on how to overcome them. The study of this area will help the policy makers to formulate their policies more efficiently, it may also help the administration to find out the gaps that are acting as hurdle for development in these areas. Geographical barriers that are currently active in this region can be identified and can be addressed accordingly through this study.

11. Contribution to existing knowledge:

Some of the contributions that this research work will make to the existing knowledge are:

- Data collection for this research work will add more detailed data to the already available data about this area.
- It will provide the ground for comparative study and will also help in understanding other similar regions.
- Some of the datas of LULC, social well-being, land degradation, urban growth and other geographical factors of Dumka district from this research work can be put to use for better understanding of the study area.
- And through this study the government officials can have additional data about the overall performance of their policies by which they can analyse their own work.

12. Future Work:

The impact of Urban Growth on Land Use/Land Cover may change according to resources and the policies formulated by the state as well as the central government as well as the changing dynamics of cultural interactions, so carrying out studies time to time will help in studying the changes in the impacts made by this factor.

Land Use/Land Cover, Urban Growth and evironment sustainability are dynamic concepts, thus, their patterns of evaluation also change with time. So, the change can be studied over time by conducting longitudinal study.

A comparative study can also be conducted by comparing the LULC of the studied region with other regions.

13. Related Reference

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